昆虫学报 *Acta Entomologica Sinica*，October 2002，45（5）：651－655 ISSN 0454-6296

# The genus *Apocolotois* Wehrli with discussions on its biogeographical features

## （Lepidoptera：Geometridae）

HAN Hong-Xiang，XUE Da-Yong*

（Institute of Zoology，Chinese Academy of Sciences，Beijing 100080，China）

**Abstract**：All three known species of *Apocolotois*，*A*. *arnoldiaria*，*A*. *smirnovi* and *A*. *almatensis* are reported and their taxonomy revised in the present paper. A new junior synonym is stated：*Chariaspilates shuangzhu* Yang＝*A*. *smirnovi*（Romanoff）. *A*. *almatensis* is recorded as new to China. The genus characters are summarized and a key to the species is given. Illustrations of adults and genitalia are presented. The biogeographical features of the genus and included species are discussed.

**Key words**：Lepidoptera；Geometridae；*Apocolotois*；revision；biogeographical features

*Apocolotois* Wehrli，1936 was erected based on the species *Himera arnoldiaria* Oberthür，1912. The other two species，*Aspilates smirnovi* Romanoff，1885 and *Apocolotois almatensis* Djakonov，1952 were included afterwards. Yang（1978）named a new species from Chifeng，Inner Mongolia，China：*Chariaspilates shuangzhu* Yang，1978，which is proved to be a new synonym of *Apocolotois smirnovi*（Romanoff）. Thus，three palaearctic species are included in the genus.

The species included are similar to each other in most structural features and wing markings. But the wing shape of the type species is considerably broader than the other two. This fact caused different authors to place *A*. *smirnovi* and *A*. *almatensis* in different genera. On the other hand，*A*. *smirnovi* and *A*. *almatensis* have almost the same wing markings，even the same variations. They can only be distinguished by differences in venation and male genitalia. In this paper，*A*. *almatensis* is newly recorded to the fauna of China and its differentiation from *A*. *smirnovi* is given.

The genus is widely distributed from Tbilisi to the Ussuri district，with quite rare collecting records. Collections in the BMNH and ZFMK are very small；there are only three specimens（two type specimens of *Chariaspilates shuangzhu* Yang，1978 and a worn male of *arnoldiaria*）in the CAU. The collection at the IZCAS is also very small，but this has been partly improved since we caught a long series of *arnoldiaria* from the west of Beijing in recent years. All known specimens are male.

Abbreviations of specimen depositories：

| | |
|---|---|
| BMNH | The Natural History Museum，London，UK. |
| CAU | China Agricultural University，Beijing，China. |
| IZCAS | Institute of Zoology，Chinese Academy of Sciences，Beijing，China. |
| ZFMK | Zoologisches Forschungsinstitut und Museum Alexander Koenig，Bonn，Germany. |

## *Apocolotois* Wehrli，1936

*Apocolotois* Wehrli，1936：144. Type species：*Himera arnoldiaria* Oberthür，1912.

*Neocolotois* Djakonov，1952：268，269. Type species：*Apocolotois almatensis* Djakonov，1952.（as a subgenus of *Apocolotois*）

*Gozmanyita* Vojnits，1975：198. Type species：*Aspilates smirnovi* Romanoff，1885.

**Male** Face rough-haired. Palpus short and rough-scaled，not projecting out face. Antenna in ♂ very strongly bipectinate. Tongue missing. Pectus and femora densely hairy. Hindtibia in ♂ with two pairs of spurs. Abdomen slender. Wings with costal margins straight，distal margins smooth，color bright yellow，with irregular red-brown lines and patches. Forewing beyond postmedi-

---

基金项目 Foundation item：This research was supported by the grant from the Knowledge Innovation Program，CAS（KZCX1-10-0x）

＊通讯作者 Author for correspondence，E-mail：xuedy@panda.ioz.ac.cn

收稿日期 Received：2002-03-06；接受日期 Accepted：2002-05-28

an line with two white spots between $M_3$ and $Cu_2$. In type species wings irrorated with dark gray spots，underside similar to the upperside，but in the other two species wings not irrorated with dark spots on upperside，hindwing much more weakly marked and less bright than forewing，underside scattered with dense brown scales and the markings on upperside very weakly expressed on underside. Forewing with $R_1$ anastomosing with Sc and $R_2$ or connected with $R_2$ by a short bar，$R_2$ diverging after $R_5$.

**♂ genitalia** Uncus，just a simple round short prominence，not bifid，no gnathos. Valva trisected，costa slender and long，the middle process finger-liked or tined on the point（apically acute），process of sacculus strongly hooked. Aedeagus simple，no cornutus.

Female unknown. We suspect that the female may be apterous.

Biology unknown.

**Diagnosis** Close to *Colotois* Hübner，especially the same long bipectinate male antenna. But in *Apocolotois* no tuft projecting from beneath antenna to eye，and no tuft projecting frontally between antenna as in *Colotois*. Tongue completely disappeared，but developed in *Colotois*. In *Colotois*，wings never bright yellow；forewing with outer margin concaved between $M_3$ and $Cu_1$，$R_2$ diverging before $R_5$；♂ uncus bifid.

**Distributions** China，Russia，Mongolia，Georgia，Turkistan，Kazakhstan.

**Biogeographical features** *Apocolotois* Wehrli is a typical palaearctic genus with the three species having different biogeographical features. Its main range is between 40°N and 50°N，from Tbilisi，west of the Caspian Sea to Machuria and Ussuri，Northeast China and Southeast of Russia. In this paper，we firstly record *A. almatensis* Djakonov and *A. arnoldiaria*（Oberthür）from the middle of Gansu Province，China. This brings the known distribution latitude of the genus down to 34°N along the northeast edge of Qinghai-Tibet Plateau.

## Key to species

1. Forewing with the subterminal dark band extending to the outer margin below $M_3$ …………………………… ***A. arnoldiaria***
   Forewing with the subterminal dark band not extending to the outer margin below $M_3$ …………………………………… 2
2. Forewing with $R_1$ anastomosing with $R_2$ at a point in the middle（fig. 8）；male valva with the middle process shorter than saccular process ………………………………… ***A. almatensis***
   Forewing with $R_1$ not touch $R_2$，but with a bar connecting them in the middle（fig. 7）；male valva with the middle process longer than saccular process ………………… ***A. smirnovi***

## 1 *Apocolotois arnoldiaria*（**Oberthür，1912**）（Figs. 1，4）

*Himera arnoldiaria* Oberthür，1912：305，pl. 159，fig. 1543. Type（s），[Russia]：Sidemi.

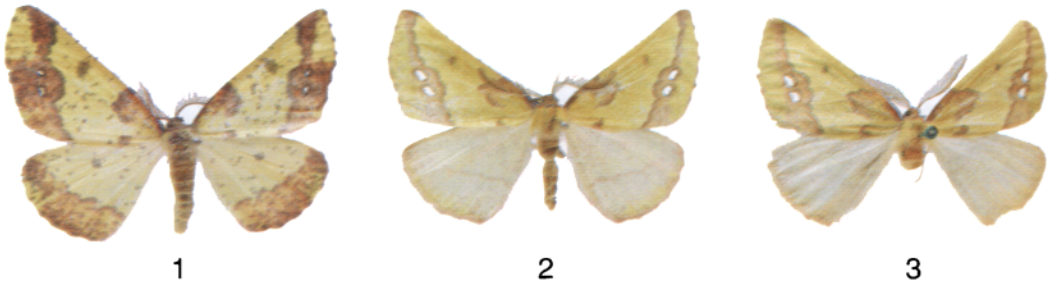
*Colotois arnoldiaria*：Prout，1915：332.

*Apocolotois arnoldiaria*：Wehrli，1936：144；Wehrli，1940：345，pl. 27：d；Viidalepp，1979：798.

**Specimens examined** Russia：Ussusi：Sutschanski-Rudnik，1 ♂，Nat. Coll.（ZFMK）. Russia：Ussusi：Wladiwostock occ，Sutschanski-Rudnik，1 ♂，Ⅶ，Nat. Coll.（ZFMK）. CHINA：Mandschurei：Charbin，150 m，1 ♂，Ⅶ，Nat. Coll.（ZFMK）. [Heilongjiang]：Harbin（Manchuria），1 ♂，Ⅷ. 1933，Coll. V. Tolachov（ZFMK）. Manchuria，1 ♂（BMNH）. Heilongjiang：Yichun：Dailing，390 m，2 ♂，5-8. Ⅸ. 1958，Nat. Coll.（IZCAS）. Jilin：Hunjiang，1 ♂，24. Ⅶ. 1983，Nat. Coll.（IZCAS）. Beijing：Xiaolongmen，1 110 m，41 ♂，20-24. Ⅸ. 1998，Coll. HAN Hong-Xiang（IZCAS）. Beijing：Liyuanling，1 100 m，11 ♂，16. Ⅸ. 2000，Coll. XUE Da-Yong（IZCAS）. Gansu：Zhengning：Zhongwan，1 ♂，7. Ⅹ. 1979，Coll. Yang Han-Quan（IZCAS）. Gansu：Yuzhong：Xinglongshan，1 ♂，22. Ⅸ. 1987，Nat. Coll.（IZCAS）. Gansu：Weixian：Gaoqiao，1 ♂，4. Ⅹ. 1992，Nat. Coll.（IZCAS）. [Jilin]：Changbaishan：Daxingqiao，1 ♂，16. Ⅸ. 1983，Nat. Coll.（CAU）.

**Distributions** China：Northeast to Gansu；Russia：Ussuri.

**Biogeographical features** *A. arnoldiaria*（Oberthür），the type species of the genus，was originally described from Sidemi，Southeast Russia and two localities in Northeast China. The latter two records were identified by Wehrli（1936，1940），each from a single specimen in the ZFMK labeled as："Charbin Mandschurei" and "Harbin（Manchuria）". Harbin is the capital of Heilongjiang Province，not modern Manchuria. For the first specimen，which had been illustrated in *Grosschmett. Erde* 4（Suppl.），pl. 27：d，the locality of "Charbin" should also be Harbin. In the present study，we found this species at several new localities in Jilin, Beijing and Gansu, greatly extending the western boundary of its known range. The size of individuals tends to become smaller from east to west.



Figs. 1 – 3 Adults of *Apocolotois*

1. *A*. *arnoldiaria* (Oberthür); 2. *A*. *smirnovi* (Romanoff); 3. *A*. *almatensis* Djakonov

### 2 *Apocolotois smirnovi* (Romanoff, 1885) (Figs. 2, 5)

*Aspilates smirnovi* Romanoff, 1885: 106, pl. 5, fig. 8. Holotype ♂, [Georgia]: Tiflis [Tbilisi]. Prout, 1915: 411, pl. 25: k; Zhu, 1981: 124, pl. 34: 871.

*Gozmanyita smirnovi*: Vojnits, 1975: 199, fig. 9 (male genitalia).

*Chariaspilates shuangzhu* Yang, 1978: 390, pl. 20: 5. Holotype ♂, China: Inner Mongolia, Chifeng. **Syn. nov**.

*Apocolotois smirnovi*: Viidalepp, 1979: 798.

**Specimens examined** China: Beijing: Xiaolongmen, 1110 m, 1 ♂, 20-24. Ⅸ. 1998, Coll. HAN Hong-Xiang (IZCAS). Inner Mongolia: Hexigten Qi: Hongguang, 1 ♂, 16. Ⅷ. 1974, Nat. Coll. (IZCAS). Inner Mongolia: Chifeng, 1 ♂ (Holotype of *Chariaspilates shuangzhu* Yang, slide no. CAU-001), 19. Ⅸ. 1957, Coll. GUAN Jing-Qun (CAU). Inner Mongolia: Zhuozi: Baoan, 1 ♂ (Paratype of *Ch*. *shuangzhu* Yang, slide No. CAU-002), 25. Ⅵ. 1965, Coll. HUANG Xu-Chang (CAU). E. TURKISTAN, 1 ♂ (BMNH).

**Distributions** China: Beijing, Inner Mongolia; Georgia: Tbilisi; Turkistan; Mongolia: Delgerhaan.

**Biogeographical features** The distribution of *A*. *smirnovi* (Romanoff) is still a mystery. It was described from Transcaucasus, far from the usual range of the genus. Vojnits (1975) recorded it from middle Mongolia (near Delgerhaan) with a statement of "New for Mongolia". He also thought that the materials from Mongolia might be a different subspecies. However, he did not describe the three available male specimens as a separate subspecies. Yang (1978) described a new species *Chariaspilates shuangzhu* Yang from the middle of Inner Mongolia (Chifeng, 118.58° E, 42.17° N; Baoan, Zhuozi, 112.33°E, 40.57°N). Zhu (1981) identified this species from Hexigten Qi, Inner Mongolia (117.31° E, 43.15°N). We collected a male from west of Beijing (115.27°E, 40.02°N) in 1998. All of these four records are highly similar to the descriptions and illustrations of Vojnits (1975). If a subspecies can be distinguished from the nominate form, it should be the same form as the specimens recorded in central Mongolia.

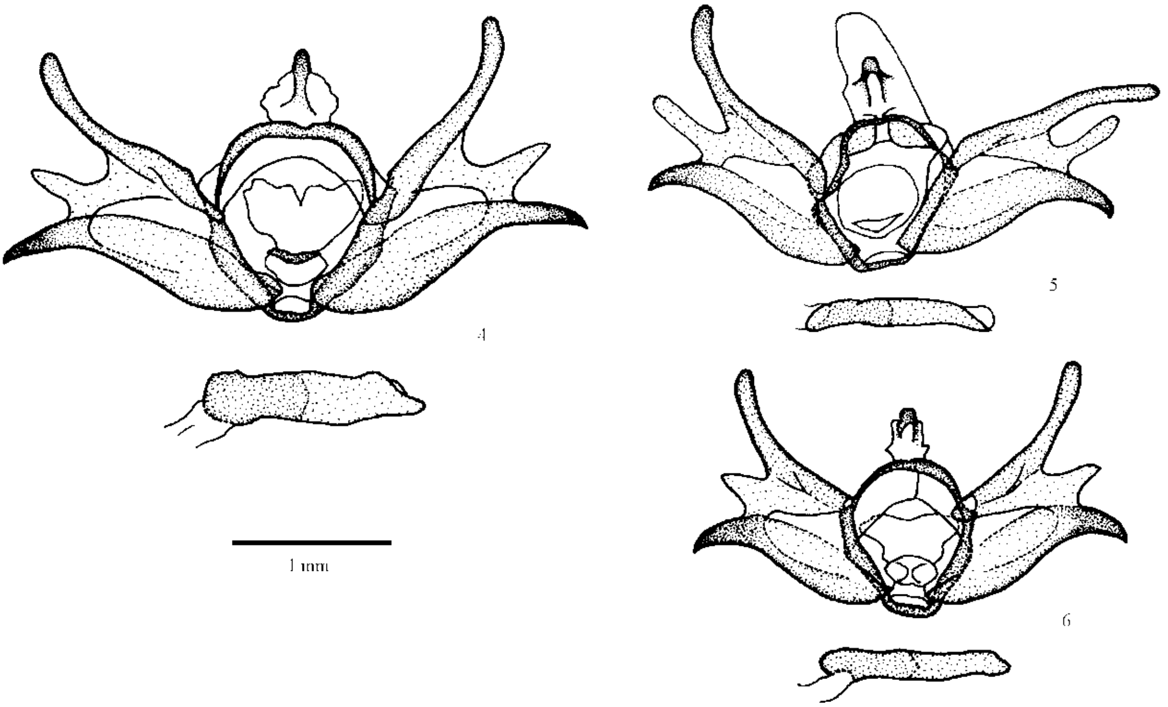
**Remarks** The type specimens of *Chariaspilates shuangzhu* Yang, 1978 are similar in both venation and male genitalia to all examined specimens of *A*. *smirnovi* (Romanoff), including a male in the BMNH, and the descriptions and illustrations of Vojnits (1975). *Ch*. *shuangzhu* Yang, 1978 should therefore be treated as a new junior synonym of the latter.

### 3 *Apocolotois almatensis* Djakonov, 1952 (Figs. 3, 6) New Record to China

*Apocolotois* (*Neocolotois*) *almatensis* Djakonov, 1952: 271, figs. 1a (venation), 2a (male genitalia). Syntypes, Kazakhstan: near Alma Alta, Zailyiskiy Alatau, River Malaya, Almaatinka.

*Apocolotois almatensis* Viidalepp, 1979: 798.

**Specimens examined** Kazakhstan: Prov. Almaty: Kuluktau Mts: Kegen Pass, 1 500 m, 1 ♂, 30. Ⅸ. 1994, Coll. Gy. Fábián & Gy. M. László (ZFMK). Kazakhstan: Prov. Almaty: Syugeti Mts: 8 km NWKok-Pek, 1 000 m, 1 ♂, 8. Ⅹ. 1994, Coll. Gy. Fábián & Gy. M. László (ZFMK). Kazakhstan, 1 ♂



Figs. 4－6 Male genitalia

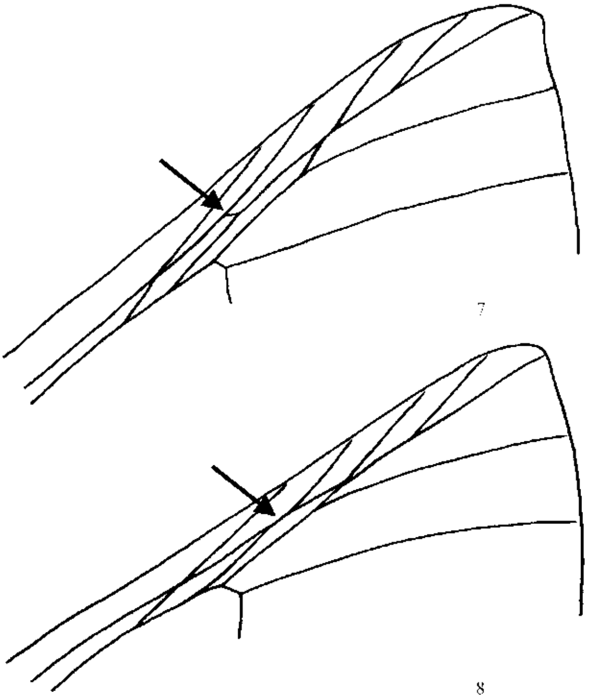
4. *A*. *arnoldiaria*（Oberthür）（Slide No. IZCAS Geom-0033）；

5. *A*. *smirnovi*（Romanoff）（Slide No. IZCAS Geom-0036）；6. *A*. *almatensis* Djakonov（Slide No. IZCAS Geom-0032）

（BMNH）. China：Gansu：Yuzhong：Xinglongshan，2 ♂，22. Ⅸ. 1987，Nat. Coll.（IZCAS）.

**Distributions** China：Gansu. Kazakhstan：Zailyiskiy Alatau.

**Biogeographical features** *A*. *almatensis* Djakonov has only been found in Kazakhstan（near Alma Alta）. It is a special interest to discuss the link between Central Asia and the middle of Gansu Province，where this species has been newly recorded in this paper. It is reasonable to suppose that Central Asia is the source of the species，a hypothesis supported by the main distribution area of the genus. This species is a good example of an insect spreading from Central Asia to the northeastern part of Qinghai-Tibetan Plateau. Generally the area from east end of the Qilian Mountains（about 103°E，36.5°N）to Lanzhou（103.5°E，36°N）is the furthest point that typical Central Asian species or genera can reach. This kind of spread obviously occurs along the Tianshan Mountains from west to east after which it is restricted by the Badain Jaran and Tengger Deserts to the north and the Qilian Mountains to the south. The spread is stopped by the change of environment at the eastern end of the Qilian Mountains. We have reported a few examples of Central Asian species having close allies in the middle of Gansu（Xue，1993；Xue and Meng，1995），however，the same species being found in both Central Asia and the eastern



Figs. 7－8 Venation of forewing

7. *A*. *smirnovi*（Romanoff）；8. *A*. *almatensis* Djakonov（the arrowheads show the relationship of $R_1$ and $R_2$）

end of the Qilian Mountains is quite rare. We expect that this species will also be found along the hypothesized migration corridor.

**Acknowledgements** We express our sincere thanks to the Trustees and Staff of the Natural History Museum, London and Dr. D. Stüning, Zoologishces Forschungsinstitut und Museum A. Koenig, Bonn for their help in checking the *Apocolotois* collections. Our thanks are also due to Dr. WANG Xin-Li, China Agricultural University, Beijing, China, for her help in arranging the loan of type specimens of *Chariaspilates shuangzhu* Yang. We also thank Dr. XIAO Hui, Institute of Zoology, Chinese Academy of Sciences, Beijing, China and the staff in the library of Department of Entomology, the Natural History Museum, London, for their help in taking photos of the treasured literature of Romanoff, 1885.

## References

Djakonov A M, 1952. New Lepidoptera, Geometridae from Kazakhstan and southern Maritime Province. *Ent. Obozr.*, 32: 268－278, figs. 1－8.

Oberthür C, 1912. Revision des Phalénites décrites par Guenée dans le species général des Lépidoptéres (Tome ix.) famille ii. *Etudes Lépid. Comp.*, 6: 223－307, pls. 144－160.

Prout L B, 1912－1916. The Palaearctic Geometrae. In: A. Seitz A. ed. Macrolepid. World, 4.: 1－479, pls. 1－25.

Romanoff N M, 1885. Les Lépicoptères de la Transcaucasie. *Rom. Mém Lép.*, 2: 1－118.

Viidalepp Ya, 1979. A list of the Geometridae (Lepidoptera) of the USSR. Communication 4. *Ent. Obozr.*, 58 (4): 782－798.

Vojnits A, 1975. Ennominae species from Mongolia, 2. (Lep., Geometridae). *Annls. hist. －nat. Mus. natn. hung.*, 67: 183－206, 14 figs.

Wehrli E, 1936. Neue Gattungen, Subgenera, Arten und Rassen (Lep. Geom.). *Ent. Rdsch.*, 54: 1－7, 126－130, 144－146, 160－163, 30 figs.

Wehrli E,, 1939－1954. Geometridae. In: Seitz A. ed. Grosschmett. Erde, 4 (Suppl.). 254－320.

Xue D Y, 1993., The *Kuldscha* Alpheraky from China with a new species (Lepidoptera: Geometridae, Larentiinae). *Sinozoologia*, 10: 379－383, 5 figs. [薛大勇，1993. 中国库尺蛾属及一新种（鳞翅目：尺蛾科：花尺蛾亚科）. 动物学集刊，10：379－383]

Xue D Y, Meng F, 1995, Three new species of Larentiinae from Gansu and Qinghai, China (Lepidoptera: Geometridae). *Acta Entomologica Sinica*, 38 (2): 222－227, 8 figs., 1 pl. [薛大勇，孟锋，1995. 甘肃、青海花尺蛾亚科新种记述（鳞翅目：尺蛾科）. 昆虫学报，38（2）：222－227，8 figs.，1 pl.]

Yang J K, 1978. Moths of North China, 2. Beijing: Beijing Agricultural University. 1－527, figs. 57－83, pls. 1－40. [杨集昆，1978. 华北灯下蛾类图志（中）. 北京：北京农业大学. 1－527，图 57－83，图版 1－40]

Zhu H F, 1981. Geometridae. *Iconocraphia Heterocerorum Sinicorum*, 1: 112－131, pls. 29－37. [朱弘复，1981. 中国蛾类图鉴，Ⅰ：尺蛾科. 112－131，图版 29－37]

---

# 雅尺蛾属研究及其生物地理学特征讨论
## （鳞翅目：尺蛾科）

韩红香，薛大勇
（中国科学院动物研究所，北京 100080）

**摘要**：雅尺蛾属 *Apocolotois* 1936 年由 Wehrli 定名，属古北界分布，世界共记录 3 种：斑雅尺蛾 *A. arnoldiaria*，二白点雅尺蛾 *A. smirnovi*，短瓣雅尺蛾 *A. almatensis*。本文记述了所有种类，其中 *A. almatensis* 为中国新记录种；修订了国内部分研究，双珠雅尺蛾 *Chariaspilates shuangzhu* Yang 被确定为二白点雅尺蛾 *A. smirnovi* 的新异名；重新归纳了属的特征并编制了分种检索表；附所有种类的成虫及♂外生殖器图。所见标本均为雄性，猜测雌蛾可能无翅。对该属及所含物种的动物地理特征进行了初步分析。

**关键词**：鳞翅目；尺蛾科；雅尺蛾属；订正；生物地理学特征

**中图分类号**：Q969.433.2　　**文献标识码**：A　　**文章编号**：0454-6296（2002）05-0651-05